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Software re-use is defined as the process of creating software systems from existing software rather than building software from scratch. Re-use can occur:

- during maintenance, re-engineering, or in the implementation of new systems
- within a system, between systems, or between a system and a library of reusable components
- at the level of code components or abstract designs.

The properties of reuse and the role of the three R's (Re-engineering, Repository, and Re-use) are essential to software maintenance. We present the statistics of system maintenance, taxonomy of reuse and the sixteen questions about software resue.

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Software Reuse

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The software reuse is defined as the process of creating new software systems from existing software rather than building from scratch. Reuse can occur during the maintenance, re-engineering, or in the implementation of new system. Reuse can also occur within a system, between systems, or between a system and a library of reusable components. In this presentation we will discuss the properties of reuse and the role of the three R's in software maintenance. Then we will brief you on compatibility, errors, how to identify a component and give a further look on repository.

Note: This research is supported by Advanced Distributed Simulation Research Consortium and Office of Naval Research

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EXAMPLES OF REUSABLE COMPONENTS

- Sort an array
- Solving a system of linear equations
- Data retrieval programs
- Hash tables for managing symbol tables

FACTORS TO KNOW TO REUSE COMPONENTS

- Exact specification
- Precise functionality
- Adaptibility of component
- Component must fit in existing code

REUSE OF ARCHITECTURE

Definition:
The way in which the various parts of a system hang together.

REUSE OF DESIGN (ACTIVITIES)

- Mapping domain
- Translation
- Simplify written text
- Procedures for domain specific algorithm

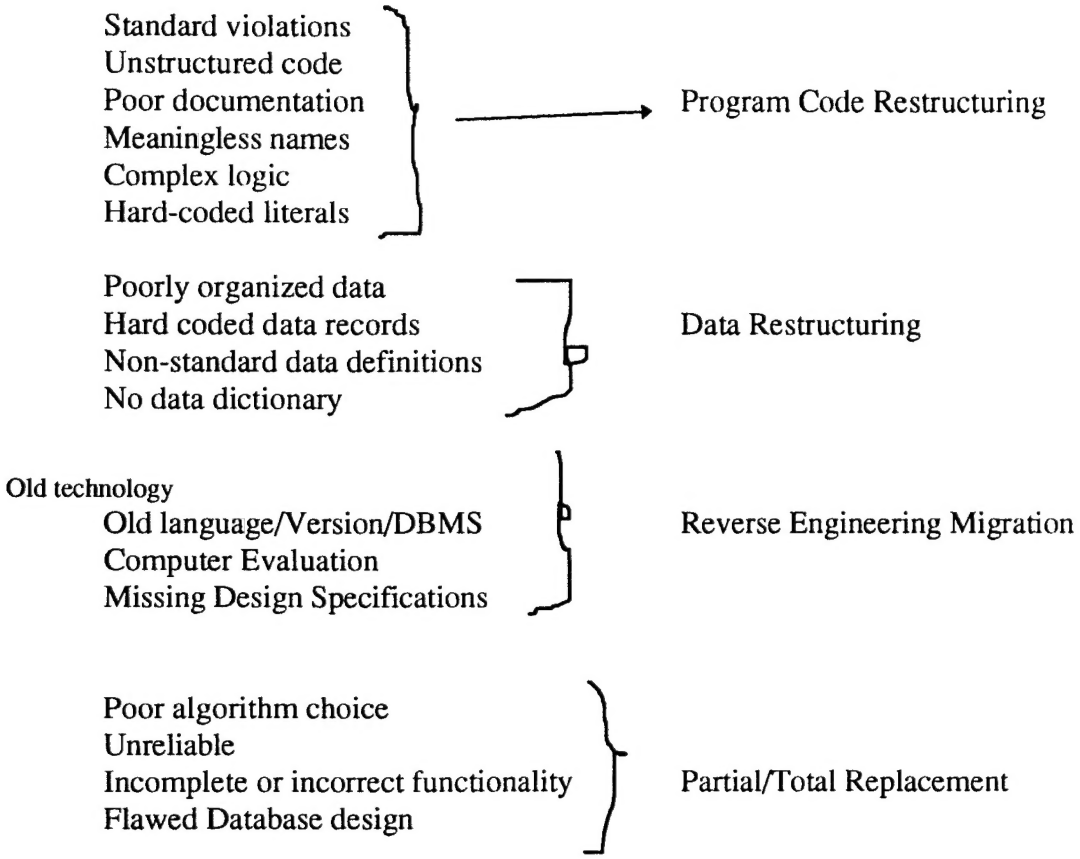
REUSABLE COMPONENT PROPERTIES

- Easy to understand with existing documentation
- Must be a completely tested code
- Must fit in existing code
- Requires no change

REQUIRED PROPERTIES OF REUSABLE COMPONENTS

- Length of component
- Complexity
- Test results
- Errors
- Quality of documentation
- Readability

CHARACTERISTICS TO LOOK FOR TO RE-ENGINEER



THREE R'S
(RE-ENGINEERING, REPOSITORY,RE-USABLITY)

REASONS TO RE-ENGINEER

- Frequent production failures
- Performance problem
- Outdated technology
- System integration problem
- Poor quality code

FRAGILE SYSTEMS LIKELY FOR RE-ENGINEERING

- Critical to the corporation
- Frequent maintenance
- Only understood by few members
- Contain bugs
- Require major enhancement

ERRORS

ERRORS IN REUSABLE CODE
- Library
- User
- System

ERRORS DETECTION

- Invariants
- Function pre-conditions
- Representation invariants

HANDLING ERRORS

- Library invariants
- Correct the problem
- Exit or Abort
- Return error value
- Create nil value

RESOURCE-LIMIT ERRORS

- Stack overflow
- Free-Store exhaustion

COMPATIBILITY

FORMS OF COMPATIBILITY
- Source compatible
- Link compatible
- Run compatible
- Process compatible

EXAMPLES OF COMPATIBLE PRACTICE

- Adding a member function
- Granting a friendship
- Loosening the protection of a member class

DOCUMENTING INCOMPATIBILITIES: every release of a library documented; all notes should be in one place in documentation

UNDOCUMENTED PROPERTIES: WHY WE RELY ON THEM

- The user may have to
- user may rely on undocumented property

Repository: A Further Look

ADVANTAGES

- Multiple Model Versions
- Multiple Architectures
- Multiple Time Management Approaches
- Technology Utilities
- Project Schedule Decoupling
- Data

TECHNICAL CHALLENGES

- Finding Modules
- Understand Module Implementations
- Incorporating Modules
- Building Systems
- Update Rate

ACTIVE REPOSITORY AGENTS

CONTROL MECHANISMS

COMPONENT IDENTIFICATION

Def:
sotware component: a container for expressing abstraction of data structures and algorithms

ATTRIBUTES THAT MAKE COMPONENTS REUSABLE

- Usefulness
- Costs (includes cost of extracting)
- Quality
  - correctness
  - readability
  - testability
  - performance
- Criteria

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